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VEG-HIVE.
An easy to grow veg-kit for urban farmers.

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Abstract: the idea of growing food in cities is not a new one; agriculture has been practiced in urban areas for millennia, often out of necessity or to obtain a food security against sudden food shortages but these are not reasons that we have to face in the modern cities. The growing interest in urban agriculture can be attributed to other factors: healthy food access, green space, air and water quality, economic development, and community engagement.
People see it as a tangible and accessible opportunity to become involved in issues of food provenance, security and to reconnect with a system that many feel far from them. Even though today's larger scale urban agriculture might have attracted more people, that isn't to say that urban agriculture can't still save our environment or food supply. The next step is crucial to understanding if it is possible to amplify the benefits that urban agriculture currently provides to a small group to a larger constituency.
The next challenge is to make people able to farm in their own spaces. I really believe urban agriculture is an area in which architects and designer can play a strong role by thinking innovative e practices and expanding its presence in our cities.

Keywords: sustainability, environment, society

1. Introduction

I believe that as human beings, as individuals and communities we have an impact on our planet.
It is a perfect system in which we live. I stand with those who believe everyone has the right to healthy food, land, water, and air.
The problem of the resources exploitation is a dangerous reality, human agriculture is a huge weight on the planet, from water pollution to energy use and soil utilization. Moreover the rapid urbanization that is taking place goes together with a rapid increase in urban poverty and urban food insecurity.
In the recent times more people are taking a look at urban farming by growing what they need where they live.
In this way, there is a decrease of the "food miles" associated with long-distance transportation and it also get the freshest produce money can buy, and people are encouraged to eat in season. They are also starting to imagine and repurpose their own urban spaces.

The outstanding feature of urban agriculture, that is also what differentiates it from rural agriculture, is that it is cohesive to the urban economic and ecological system. The urban agriculture is an active and fervent part of the urban ecosystem.
Such connections include the role of citizenry as worker, the use of common urban resources (like organic waste as compost and urban wastewater for irrigation), a direct channel to consumers, a direct impact on urban ecology, being part of the urban food system.
In all this I am realist and I perfectly know that Urban farming can't feed us.
But from my research I discover that the benefits of urban farming aren't just environmental or nutritional but they are social. People come together around the ancient idea of sustaining themselves learning, most of the times, from the olds of their family. Everybody can be involved in the work of growing his own food even if it's just a plant of lettuce.
These physical and virtual groups who care about what they eat and about our planet are growing fast and they are always looking to smart solution to farm.
What motivates people the most is the possibility for them to be involved to food security and nutritional health. Now in some countries, like in America, the places where people can buy food are fast-food and convenience stores where they sell trash foods that are full of fat, sugar. Some communities have no fresh food sellers of any kind, in their proximity. This deficiency of access to healthy foods makes it difficult for families to eat well, powering the rising obesity epidemic and the severe health problems that are associated to this condition. Studies have reliably shown that in low income communities there are fewer supermarkets and other retail channels selling cheap, nutritious food. This situation is a mirror of what happen in the African American and Latino neighborhoods. Other studies show that in the places where people have better access to fresh products and they consume healthier diets and they have lower rates of diet-related diseases than their corresponding item in neighborhoods with deficient food access. Urban agriculture is one pioneering method to improve access to healthy food.
Urban agriculture helps to correct this gap by lowering the price of healthy food. It eliminates the middleman and increases the chance for community members in need to easily be able to be part in the growing of this food. Many urban farmers also adopt charitable models trying to support communities in necessity through direct donation or by providing either discounted or free produce.
These are not the only advantages that urban agriculture has had and in the near future we will see the other positive effects on individual health and in the community improvement, as predicted by horticultural therapists.

2. Inquiry

The Urban agriculture nowadays is a developing phenomenon that consist in growing plants within or around the cities. What distinguishes the urban agriculture from the rural agriculture, is that it is integrated into the urban economic and ecological system. That means the usage of urban residents as workers, the use of typical urban "resources" (like organic waste as compost and urban wastewater for irrigation), a direct links with the consumers, a direct impact on urban ecology that we can consider both negative or positive, being part of the production food system, being influenced by urban policies and plans and as result be more involved in the city, etc.
In each city, a further specification of urban agriculture is possible by looking at the following dimensions: types of actors involved, types of location, types of products grown and scales of production and technology used.
City agriculture takes the form of roof-top and balcony, it makes community gardening happen in vacant lots and others vacant open spaces.

This is an important way to improve environmental and production efficiency benefits. In a perfect world the use of this production line of integrated farming systems will protect soil fertility and will avoid its exploitation.
In the future this kind of cultivation will protects habitats for a widened diversity of flora and fauna, it will reduces the emissions of CO2.
In simple words, urban farming is growing and producing food in a city even if often people confuses the urban agriculture with the practice of community gardening.
What is happening in this period is that urban agriculture is assuming a big level of popularity, there is a crescent interest in growing products for personal consumption or sharing.
People are realizing that they don't have to have a large area of land. Everyone could start an urban farm: a single person, a couple of friends, or a neighbourhood group. And it is this democracy the true point of strength of this practice plus the direct channel from the grower to the user.
The possibility to understand the food system. Most people desire to have more input into the lifecycle of their food, how it is grown, how it is treated after being harvested and how it moves from one place to another. The users have begun to be conscious about the life of their food, about their journey from the land to their kitchen. It becomes important consider how far food travels and before of that how and in what the food is grown.
Urban agriculture can be able to answer to all these questions and satisfied the users' needs so it can take a rightful place is the larger food system.
This can be the first step in the new cycle of the food system. This kind of agriculture has become a good way to increase contact between the locally grown food and the clients and it is also a perfect way of reintroducing the people to the many aspects of food that in modern days they have lost as a culture. It is important to know how food grows, what grows regionally and seasonally because we lost all these aspects in our time. All this information can be used to teach to the residents how to be a better-informed consumer.
But where all of this happen? Urban has come to mean parts that could be both on the perimeter or in the centre of the city. The interesting and important thing is that there is no a single characterization of size or placement. People can farm in different areas, some are on rooftops, on landfills, brownfields, or places where buildings of every nature may have been demolished. This phenomenon is developing so deep in the society that some city administration are giving up part of their park systems or simply part of their public spaces to allow urban farmers to plant their seeds.

Some of this urban farm are built exclusively for educating both kids and adults or simply to training them. Some are born to expand food access in a specific community or to continue traditional culinary cultures. Some are built for economic reasons because people start to recognize that the savings on food transportation are valuable and that can make decrease the cost of their food as well as the decrease of traffic pollution can make them more environmentally responsible. For others the reason is the food justice, they develop urban farms in their communities to let all have an access to quality foods, focusing on the economically disadvantaged communities that are growing in this crisis period.

Studying the different communities, I discovered a beautiful word made of people who work hard and look for every way to farm in their own spaces. This scenario pushes me to focus to the people who would do it but can't. There are a lot of people who try to produce some kind of food on their balcony.
The main complaint is not about the space, they are able to find it even in the stranger places, but about all the system behind the farming. What emerges from the research is that these people main request is SEMPLICITY.

They don't desire a solution that have to be too technologically advanced even if they are technological person.
This sounds like a paradox to me but what I have understood in this period is that there is something mental, even ancestral, in what they expect from the action of farming. Like a back to the origins. This object become a connection with their roots, during the beginning of my research I interviewed a lot of people that connected the idea of farming with the memories of their grandparents.
As an unconscious inheritance. But it also got a social purpose, connecting the new generation with the elderly that can pass down their knowledge in a field that nowadays we could consider a lost art that most of the young people ignore. Is like a second youth for them that often find this activity as full time one. But it is not only teens who can learn, even the kids thanks to the easiness of the farming kit can be involved and can be educated to an environment friendly life and to a better health food culture. Studies have proved that there is an incidence between the time kids start to acquire this competence about a well-being lifestyle and a good food hygiene and their health status. There is a minor possibility that them will need cures to food illness.
This is like a psychological status that make people, especially in the Mediterranean area, associate the simplicity of the shape and the action of farming to a memory of their childhood.
The typical user of veg-hive is a person theoretically involved in the urban agriculture idea, who cares about the quality of his life, his food and about the environment but who doesn't have time and space to cultivate.

3. Result

2.1 The project

The choice to be faithful to an ideal and the beauty of simplicity, these are the main concept behind my project.
The basic objectives of sustainability are to reduce consumption of non-renewable resources and minimize waste. Sustainable design principles include the ability to : minimize non-renewable energy consumption; use environmentally preferable products; protect and conserve water optimize operational and maintenance practices. Utilizing a sustainable design philosophy encourages decisions at each phase of the design process that will reduce negative impacts on the environment and the well-being of the users, without compromising the bottom line.
Such an integrated approach positively impacts all phases of the object life-cycle: design, production, use and landfill.

Veg-hive is a combinable system of greenhouses that can be used to cultivate different kind of vegetables and fruits. It is an object that could be easily use by everyone from four to one hundred years old. It is a fun kit to merge two very interesting topics: the urban farming and the ecologic culture. It is simple to assemble thanks to the magnets that connect the frames to the base and to each other. Thanks to transparent greenhouse, the peat and the seeds included in the kit, you can give birth and grow many types of vegetables at any time of the year.

This project is the perfect summary of my research, it mirrors the different shades of the personality of the possible users.

The greenhouse can be used for raising seedlings, as it grants an insulated environment for the plants inside to thrive. The rest is up to the people as they can fill the mini greenhouses for a window sill, or put the greenhouse in the kitchen and create an edible garden of fresh herbs for cooking.
But why a greenhouse?

The explanation is that the greenhouse and especially its new versions, that are already prepared, are the main solution to let people farm, even if they don't have green thumb.
This ability is generally granted by the greenhouse effect: the warmer temperature in a greenhouse due to the incident solar radiation that passes through the glass roof and walls and is absorbed by the floor, earth, and contents, which become warmer and re-emit the energy as longer-wavelength infrared radiation. The perfect climate just need to add water to thrive.
First thing to consider when planning to start to farm in an indoor greenhouse is the type and quantity of plants that will grow in it. Then focusing on what people will do. Will they be looking to germinate and grow successfully their own herbs or vegetables? What will they need to maintain ideal conditions for the plants? Considering that most plants and herbs do well when the greenhouse conditions mimic that of the Mediterranean climate. They will need light, dry and cool conditions. That is what people should try to recreate in their home. This is the reason why planning what kind of cultivation they could grow is so important. It will influence the type of exposure and the place where they will put veg-hive and the results they will purchase.
How much of their veg and herbs they will use in cooking (or want to sell or give away) is also be considered as much as where to grow their products in the house.
Basements it is good because is able to offer less temperature variations and this let easily control the growing conditions, it also let people farm no matter what the season. Attics and higher floors can be too hot, especially in summertime. Ground floor areas are also good, it works well but the problem is that most people don't have the space.
Those wanting to harvest from plants in smallest space will want to enclose their plants in a reflective grow tent or maybe in a closet. That is good because these small spaces make it easy to control the different conditions as light, temperature, humidity and air circulation. This will let the plants thrive. Plants are very versatile and can be grown in different places as open on racks, shelves or hanging baskets.

If their desire to join this circle is so deep that they are willing to follow this kind of solutions, our role as designer is to help them in this and improve their condition. The lack of a yard should not be an insurmountable problem that keep people from growing vegetables. With "boxes" and some space on a well-lighted place, people can grow organic vegetables. Some plants are more suited to growing in a small space than others. That's why some herb-growing set, as veg-hive, are carefully designed so that they might be the centrepiece of the room.

Access to the plants is also important. People have to make sure they can get to the grow space easily and have enough space to water and care for their plants. Moving plants in the greenhouse can involve heavy lifting that is why people have to make sure there's room to reach and safely lift plants when they need to be removed. Nearby plug-ins and a water source should be convenient, safe and functional.

2.2 The shape

From an analysis of a bees' honeycombs, I see that the hexagonal patterns are prevalent in nature due to their efficiency.
We use the word honeycomb in the broad sense to describe this set of identical common-walled prismatic cells. Cells can be hexagonal shape, just like the honeycomb of bees.
But why hexagons? It is a simple matter of geometry. If we think to pack together cells that have both identical shape and size and with these cells we want to fill all of a flat plane, we only find three regular shapes that have all sides and angles identical that will work: equilateral triangles, squares,

and hexagons. Analysing all of these, hexagonal cells require the least total length of surface, compared with the other figures, triangles or squares of the same area. So it is perfectly logical that the bees would choose hexagons. Making wax costs the bees a lot of energy, and they will want to use to build their hive as little as possible of material, they will economize just as some builders might want to save on the cost of their construction materials. This was studied for centuries but it was understood only in the 18th century. It was Darwin who stated that the work of the bees for the hexagonal honeycomb is "absolutely perfect in economizing labour and wax."
Darwin trough his studies arrived to think that the bees were influenced in their choice of the shape and in the making of these wax chambers by the natural selection that had predisposed them for making them. The key is in the advantage of using it. They needed less energy and time than with other shapes. But even if bees seem to possess specialized skills to measure angles and wall thickness, not everyone agrees with Darwin. Some say that because for them making hexagonal arrays of cells is something that nature does anyway.
In a hexagonal grid each line is as short as it can possibly be if a large area is to be filled with the fewest number of hexagons. This means that honeycombs require less wax to construct and gain lots of strength under compression. This characteristic guarantee solidity to the structure that can be considered self-supporting.
The study of explicit plan mechanisms whereby the solid cell is deformed and arrives at break. The stiffness and resistances in the floor (in this case in the plane X Y) are the lowest since the stresses tend to curve the cell walls. The stiffness and strength out of the plane (Z-direction) are greater because they are quire an extension or a compression of cell walls.

2.3 The importance of the materials

The choice of materials was guided by the desire to be as faithful as possible to the green philosophy that characterizes the whole essence of the project.
The shell is made of 100% recyclable and recycled materials while the greenhouse is completely compostable and of plant origin.
I always consider the difference between biodegradable and compostable during the design process in an effort to remain faithful to my thought.
All materials are produced and manufactured in accordance with the effort to preserve as much as possible on our planet and its ecosystem.
Recycled materials are starting to replace part of virgin materials in different applications and this already shows great benefits to the society and environment.
The use of recycled materials can hopefully save landfill places, natural resources, and the energy consumed for producing the virgin materials. Also the low price of recycled materials is favourable to use it in the production as it increases the profits.
Recycling is the process of converting waste materials into new materials and objects. It is a new alternative to normal waste disposal that can save material and help lower the pollution produced by the industry. Recycling can avoid the waste of potentially useful materials and reduce the waste of fresh raw materials and also it could reduce: energy usage, air pollution that come from the incineration and the water pollution that come from landfilling.
The recyclable materials are all waste that can be reused to produce new objects that are equal to the scrap (for SSE. glass, paper) or reused to produce new materials (wood, textiles).
Recycling is a crucial component of modern waste reduction. Since it is used the waste hierarchy it is the third component of the "Reduce, Reuse, and Recycle".

The recycling of plastic is the generation of a new “secondary raw material” through the plastic waste, rework selected by type and in some cases even for color. It is important not only for the saving of raw materials (oil) and energy, but also to reduce the accumulation in the environment of non-biodegradable substances.
The plastic, in fact, is by definition a “plural” with infinite applications and the same goes for the recycled. Paper recycling becomes a linear motion in a circular.
There are some ISO standards related to recycling such as ISO 15270:2008 for plastics waste and ISO 14001:2004 for environmental management control of recycling practice.

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